

**FORMAT 2**

24-UCCh. Revised 12/9/2015

Submit originals (including syllabus) and one copy and electronic copy to the **Faculty Senate Office**  
 See <http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures/> for a complete description of the rules governing curriculum & course changes.

**CHANGE COURSE (MAJOR) and DROP COURSE PROPOSAL**  
 Attach a syllabus, except if dropping a course.

**SUBMITTED BY:**

Department	Civil and Environmental Engineering	College/School	CEM
Prepared by	Srijan Aggarwal	Phone	474.6120
Email Contact	saggarwal@alaska.edu	Faculty Contact	Srijan Aggarwal

**1. COURSE IDENTIFICATION: As the course now exists.**

Dept	ENVE	Course #	F646	No. of Credits	3
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<b>COURSE TITLE</b>	Unit Processes: Biological
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**2. ACTION DESIRED:**  Check the changes to be made to the existing course.

Change Course	<input checked="" type="checkbox"/>	If Change, indicate below what is changing.	Drop Course	<input type="checkbox"/>
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<b>NUMBER</b>	<input type="checkbox"/>	<b>TITLE</b>	<input checked="" type="checkbox"/>	<b>DESCRIPTION</b>	<input type="checkbox"/>
<b>PREREQUISITES*</b>	<input type="checkbox"/>	<b>FREQUENCY OF OFFERING</b>		<input type="checkbox"/>	<input type="checkbox"/>

\*Prerequisites will be required before a student is allowed to enroll in the course.

<b>CREDITS (including credit distribution)</b>	<input type="checkbox"/>	<b>COURSE CLASSIFICATION</b>	<input type="checkbox"/>
<b>ADD A STACKED LEVEL (400/600)</b> Include syllabi.	<input checked="" type="checkbox"/>	Dept. ENVE	Course # F446

<b>How will the two course levels differ from each other? How will each be taught at the appropriate level?:</b>	1. Graduate students do a course project. 2. Graduate students lead journal article discussions. 3. Homework/exams will be designed separately to test deeper understanding of concepts for graduate students.
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Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi—undergraduate and graduate versions—will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online – see URL at top of this page.

<b>ADD NEW CROSS-LISTING</b>	<input type="checkbox"/>	Dept. & No.	<input type="checkbox"/>	Requires approval of both departments and deans involved. Add lines at end of form for additional signatures.
<b>STOP EXISTING CROSS-LISTING</b>	<input type="checkbox"/>	Dept. & No.	<input type="checkbox"/>	Requires notification of other department(s) and mutual agreement. Attach copy of email or memo.
<b>OTHER (specify)</b>	<input type="checkbox"/>			

**3. COURSE FORMAT**

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council and the appropriate Faculty Senate curriculum committee. Furthermore, any core course compressed to less than six weeks must be approved by the Core Review Committee.

<b>COURSE FORMAT:</b> (check <u>all</u> that apply)	<input type="checkbox"/>	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input type="checkbox"/>	5	<input checked="" type="checkbox"/>	6 weeks to full semester
<b>OTHER FORMAT (specify all that apply)</b>	<input type="checkbox"/>											
<b>Mode of delivery (specify lecture, field trips, labs, etc.)</b>	Lecture											

4. **COURSE CLASSIFICATIONS:** (undergraduate courses only. Use approved criteria found in Chapter 12 of the curriculum manual. If justification is needed, attach separate sheet.)

H = Humanities	<input type="checkbox"/>	S = Social Sciences	<input type="checkbox"/>
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Will this course be used to fulfill a requirement for the baccalaureate core?	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>
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IF YES\*, check which core requirements it could be used to fulfill:

O = Oral Intensive, *Format 6 also submitted	<input type="checkbox"/>	W = Writing Intensive, *Format 7 submitted	<input type="checkbox"/>	X = Baccalaureate Core	<input type="checkbox"/>
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4.A **Is course content related to northern, arctic or circumpolar studies? If yes, a "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.**

YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>
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5. **COURSE REPEATABILITY:**

Is this course repeatable for credit?	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>
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Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).	<input type="text"/>
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How many times may the course be repeated for credit?	<input type="text"/>	TIMES
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If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?	<input type="text"/>	CREDITS
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6. **COMPLETE CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking, clearly showing the changes you want made. (Underline new wording strike through old wording and use complete catalog format including dept., number, title, credits and cross-listed and stacked.) Example of a complete description:**

**PS F450 Comparative Aboriginal Indigenous Rights and Policies (s)**

3 Credits

Offered As Demand Warrants

Case-study Comparative approach in ~~assessing~~ analyzing ~~Aboriginal~~ Indigenous rights and policies in different nation-state systems. ~~Seven-Aboriginal-situations~~ Multiple countries and specific policy developments examined for factors promoting or limiting self-determination. Prerequisites: Upper division standing or permission of instructor. (Cross-listed with ANS F450.) (3+0)

**ENVE F646 Biological Unit Processes—Biological**

3 Credits

Offered Spring Even-numbered Years

Theoretical and applied aspects of biological wastewater treatment, including waste-activated sludge processes, trickling filters, lagoons, sludge digestion and processing, nutrient removal, biology of polluted waters, state and federal regulations. Recommended: Graduate standing or permission of instructor. Stacked with ENVE F446(3+0)

**ENVE F446 Biological Unit Processes**

3 Credits

Offered Spring Even-numbered Years

Theoretical and applied aspects of biological wastewater treatment, including waste-activated sludge processes, trickling filters, lagoons, sludge digestion and processing, nutrient removal, biology of polluted waters, state and federal regulations. Prerequisites: MATH F302, or instructor permission. Recommended: CE F341. Stacked with ENVE F646(3+0)

7. **COMPLETE CATALOG DESCRIPTION AS IT SHOULD APPEAR AFTER ALL CHANGES ARE MADE:**

**ENVE F646 Biological Unit Processes**

3 Credits

Offered Spring Even-numbered Years

Theoretical and applied aspects of biological wastewater treatment, including waste-activated sludge processes, trickling filters, lagoons, sludge digestion and processing, nutrient removal, biology of polluted waters, state and federal regulations. Recommended: Graduate standing or permission of instructor. Stacked with ENVE F446(3+0)

**ENVE F446 Biological Unit Processes**

3 Credits

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Theoretical and applied aspects of biological wastewater treatment, including waste-activated sludge processes, trickling filters, lagoons, sludge digestion and processing, nutrient removal, biology of polluted waters, state and federal regulations. Prerequisites: MATH F302, or instructor permission. Recommended: CE F341. Stacked with ENVE F646(3+0)

**8. GRADING SYSTEM: Specify only one.**LETTER: PASS/FAIL: **9. ESTIMATED IMPACT**

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

None

**10. LIBRARY COLLECTIONS**

Have you contacted the library collection development officer (*kljensen@alaska.edu*, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No Yes  9/10/2015**11. IMPACTS ON PROGRAMS/DEPTS:**

What programs/departments will be affected by this proposed action?

Include information on the Programs/Departments contacted (e.g., email, memo)

Positive impact on Civil Engineering, Environmental Engineering, Biology

**12. POSITIVE AND NEGATIVE IMPACTS**Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.

Positive impact: Will offer opportunity for students in CNSM and CEM to enroll in a semester long dedicated on biological unit processes in environmental systems.

No negative impact.

**13. JUSTIFICATION FOR ACTION REQUESTED**

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. If you ask for a change in # of credits, explain why; are you increasing the amount of material covered in the class? If you drop a prerequisite, is it because the material is covered elsewhere? If course is changing to stacked (400/600), explain higher level of effort and performance required on part of students earning graduate credit. Use as much space as needed to fully justify the proposed change and explain what has been done to ensure that the quality of the course is not compromised as a result.

Need for stacking

Biological treatment processes is an essential component of environmental engineering coursework needed for those working in the field of wastewater- urban or rural. Currently civil engineering undergraduate students do not have a way to access this material in detail via the undergraduate class CE 341. This will also help with student enrolments and getting the class offered on a regular basis, providing opportunity for graduate students in other departments (from CNSM) and local agencies (e.g., Department of Environmental Conservation) to take the class.

Differences in 400/600 courses

While the overall topics for the class remain common for undergraduate and graduate student, for the students earning graduate credit, the course will primarily differ in following three ways.

1. Graduate students would be required to do a course-project on the topic of biological unit processes, demonstrating graduate level understanding and application of concepts learnt in the class. Course project will *not* be a requirement for the Undergraduate students.

2. Graduate students will be leading the journal article discussion (as assigned) along with presenting a critical summary to the entire class. To *not overtax* the UG students, they are not required to turn in any assignments associated with journal discussions nor have any associated points. They just benefit by observing and participating when graduate students lead the journal discussions.
  
3. The homework assignments and exams will be handed out in two categories: requiring demonstration of deeper understanding of the concepts for the graduate students.

*(See attached signatures)*

**APPROVALS:** (Forms with missing signatures will be returned. Additional signature blocks may be added as necessary.)

	Date	
Signature, Chair, Program/Department of: _____		

	Date	
Signature, Chair, College/School Curriculum Council for: _____		

	Date	
Signature, Dean, College/School of: _____		

Offerings above the level of approved programs must be approved in advance by the Provost (e.g., non-graduate level program offering of a 600-level course):

	Date	
Signature of Provost (if applicable) _____		

**ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE.**

	Date	
Signature, Chair Faculty Senate Review Committee: ___Curriculum Review ___GAAC ___Core Review ___SADAC		

**ADDITIONAL SIGNATURES:** (As needed for cross-listing and/or stacking; add more blocks as necessary.)

	Date	
Signature, Chair, Program/Department of: _____		

	Date	
Signature, Chair, College/School Curriculum Council for: _____		

	Date	
Signature, Dean, College/School of: _____		

Note: If removing a cross-listing, you may attach copy of email or memo to indicate mutual agreement of this action by the affected department(s).

If degree programs are affected, a Format 5 program change form must also be submitted.

Differences in 400/600 courses

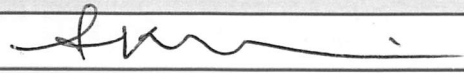
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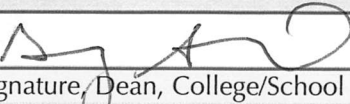
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The homework assignments and exams will be handed out in two categories: requiring demonstration of deeper understanding of the concepts for the graduate students.

**APPROVALS:** Add additional signature lines as needed.

<i>See attached - signed in wrong spot</i>	Date	
Signature, Chair, Program/Department of:		

	Date	9-28-15
Signature, Chair, College/School Curriculum Council for:	CEM	

	Date	10/5/15
Signature, Dean, College/School of:	CEM	

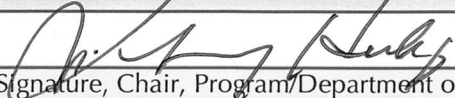
Offerings above the level of approved programs must be approved in advance by the Provost.

	Date	
Signature of Provost (if above level of approved programs)		

**ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE**

	Date	
Signature, Chair Faculty Senate Review Committee: ___Curriculum Review ___GAAC ___Core Review ___SADAC		

**ADDITIONAL SIGNATURES:** (As needed for cross-listing and/or stacking)

	Date	9/28/2015
Signature, Chair, Program/Department of:		

	Date	
Signature, Chair, College/School Curriculum Council for:		

	Date	
Signature, Dean, College/School of:		

**ATTACH COMPLETE SYLLABUS (as part of this application).** This list is online at: <http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/>  
The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course (or changes to it) may be denied.

#### **SYLLABUS CHECKLIST FOR ALL UAF COURSES**

During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

##### **1. Course information:**

Title,  number,  credits,  prerequisites,  location,  meeting time  
(make sure that contact hours are in line with credits).

##### **2. Instructor (and if applicable, Teaching Assistant) information:**

Name,  office location,  office hours,  telephone,  email address.

##### **3. Course readings/materials:**

Course textbook title,  author,  edition/publisher.  
 Supplementary readings (indicate whether  required or  recommended) and  
 any supplies required.

##### **4. Course description:**

Content of the course and how it fits into the broader curriculum;  
 Expected proficiencies required to undertake the course, if applicable.  
 Inclusion of catalog description is *strongly* recommended, and  
 Description in syllabus must be consistent with catalog course description.

##### **5. Course Goals (general), and (see #6)**

##### **6. Student Learning Outcomes (more specific)**

##### **7. Instructional methods:**

Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

##### **8. Course calendar:**

A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

##### **9. Course policies:**

Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

##### **10. Evaluation:**

Specify how students will be evaluated,  what factors will be included,  their relative value, and  how they will be tabulated into grades (on a curve, absolute scores, etc.)  Publicize UAF regulations with regard to the grades of "C" and below as applicable to this course. (Not required in the syllabus, but is a convenient way to publicize this.) Link to PDF summary of grading policy for "C":

[http://www.uaf.edu/files/uafgov/Info-to-Publicize-C\\_Grading-Policy-UPDATED-May-2013.pdf](http://www.uaf.edu/files/uafgov/Info-to-Publicize-C_Grading-Policy-UPDATED-May-2013.pdf)

##### **11. Support Services:**

Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

**12. Disabilities Services:** Note that the phone# and location have been **updated**. <http://www.uaf.edu/disability/> The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.

State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655) to provide reasonable accommodation to students with disabilities.

5/21/2013

# ENVE F646 Unit Processes: Biological 3-credits

Department of Civil and Environmental Engineering, University of Alaska Fairbanks  
Spring 2016

**Instructor:**

Dr. Srijan Aggarwal, Assistant Professor,  
Water & Environmental Research Center  
Department of Civil and Environmental Engineering  
Room 271 Duckering, Tel 474-6120, [saggarwal@alaska.edu](mailto:saggarwal@alaska.edu)

**Pre-requisites:** None

Recommended: Graduate standing or permission of instructor.

**Lectures:**

Tuesday & Thursday 15:40-17:10, Duck 306

**Office Hours:**

Tues. 11:00-12:00, Thurs. 11:00-12:00, but feel free to stop by any time

**Textbook:**

Required: Metcalf & Eddy, revised by G. Tchobanoglous, F.L. Burton and H.D Stensel: Wastewater Engineering Treatment and Reuse. McGraw Hill, 4th edition, 2003 (in bookstore).

Further reading materials may be assigned / handed out in class.

**Course Description:**

This course is useful for students or professionals interested in the field of environmental engineering and science, and specifically in processes related to biological wastewater treatment. The course discusses various theoretical and applied aspects of biological wastewater treatment, including waste-activated sludge processes, trickling filters, lagoons, sludge digestion and processing, nutrient removal, biology of polluted waters, state and federal regulations.

**Course goals:**

- To equip students with engineering design and troubleshooting skills related to wastewater treatment
- To make students aware of the current advances and challenges in bioprocesses
- To impart effective and clear communication skills

**Student learning outcomes:**

After going through this course students will be:

- able to apply mathematical principles to wastewater treatment
- aware and familiar with federal and state regulations in wastewater field
- approach analysis and design of systems for rural wastewater treatment
- more comfortable in reading and critique of primary scientific literature

**Instructional methods** Lectures with supporting reading from textbooks and primary scientific literature will form the knowledge base of the course. Relevant journal articles will be assigned for critical group discussion.

### Evaluation/Grading Policy :

Quizzes	10 %
Homework	20 %
Journal Discussion	10%
Project	20%
Midterm Examination	20 %
Final Examination	20 %

Final grades will be awarded according to the following scale:

95-100 **A**; 90- <95 **A-**; 85 - <90 **B+**; 80 - <85 **B**; 75-<80 **B-**;  
70 - <75 **C+**; 65 - <70 **C**; 55-<65 **D**; <55 **F**

Either the weighted percentages or a curve maybe used, whichever gives best grades.

### Course Policies

1. **Academic integrity.** Each student must become aware of UAF's policy on academic integrity as detailed in the *Student Code of Conduct*, p. 50 of the 2014-2015 catalog. The FIRST violation of the student code will result in immediate failure of the course and/or disciplinary action as per UAF policy.
2. **Communication.** Outside of scheduled lectures and office hours, email is the official form of communication. When sending a message to the instructor, please use ENVE646 in the subject line. Students are expected to check their UAF email accounts for course updates. In addition, UAF Blackboard will be used for general announcements, distribution of course materials and posting of grades.
3. **Exams.** One mid-term exam and a final will be given during the semester (see course calendar). Each will be designed to test your understanding of critical concepts and your ability to solve problems. Exams are closed book/closed notes, however you may use a **single 8.5"** by 11" cheat sheet of your own creation.
4. **Quizzes.** Six to eight surprise quizzes (open book and notes) will be conducted during the course of the semester. Best five quizzes will be considered for the final grade. No make-up quizzes.
5. **Homeworks.** Regular homework problems will be assigned throughout the semester (see course calendar). Homework assignments are due at the 5:00 PM on the due date. Late homework will **NOT** be accepted without prior approval from the professor.
6. **Make up exams:** Exams must be taken on the assigned dates (see course calendar) and in general there will be no makeup exams. Makeups will be given only under extreme circumstances. It is expected that the student will contact the instructor sufficiently in advance of an exam or have sufficient reason that they could not do so. Valid reasons include severe sickness (attested by physician's certificate), bereavement, or travel on university business (a letter in advance from the supervisor or responsible official).



7. **Absence.** If you are absent from any class it is your responsibility to inform yourself about the class material or any announcements. If you miss a quiz or homework you receive a “zero grade”, except when you have made arrangements beforehand for reasons as stated above.
8. **Attendance.** Class attendance at all lectures is **required** and will be monitored. The professor reserves the right to adjust final grades up or down based on a student’s course participation. You are welcome to ask questions in class or during office hours. Class participation and discussion makes the course lively and interesting for everyone.
9. **Homework Format:** It is imperative that engineering work be well organized and neatly presented in order to convey the desired information to peers, clients, and other interested parties in a clear, logical manner. Developing these skills of written communication is critical to career development. Pay close attention to these while submitting homework and exams.
10. **Journal Article Discussion.** Articles from scientific wastewater literature will be assigned to each student, and a class discussion will be led by the student on his/her assigned paper on a pre-decided date (see schedule).
11. **Course Project.** The course includes a project, evaluated in the form of an oral presentation at the end of the semester. Students may work in groups of up to 2 people. Projects must have a clear research question or problem statement, and then provide quantitative analysis addressing that question. Presentation will approximately be 10 minutes. Each student will provide an evaluation of the contribution of other students in his or her group and of the quality of other group’s projects.

**Deadline for group projects:**

1. March 1 – By class time, decide groups and topics.
  2. April 1 – By 5:00 PM, turn in a sheet with project title and a half page summary of proposed research question and analysis approach.
  3. Group presentations will occur approximately during the last two weeks of classes; the exact date will be selected later in the semester.
12. **Incomplete.** An "incomplete" will not be given unless severe illness, family tragedy, or a sudden transfer is involved. A written explanation and the completion of the appropriate UAF paperwork must be submitted in all cases.
  13. **Disabilities.** If you have specific physical, psychiatric or learning disabilities and require reasonable accommodations, please let me know early in the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability to ‘Disability Services’ in room 208 of the Whitaker Building and request a letter of accommodation.

## General course outline

No.	Topic	Textbook Chapter
1	Overview	1
2	Wastewater flow rates and constituents	2-3
3	Reactor kinetics	4
4	Biological treatment fundamentals	7
5	Biological processes with suspended growth	8
6	Biological processes with attached growth	9
7	Anaerobic biological processes	10
8	Treatment of Solids	14

## Detailed course outline

Date	Topic	Hwout	HW in	Journal discussion
Class 1	Overview			
Class 2	Solids, nutrients, organics			
Class 3	ThOD, COD, BOD calc	HW1		
Class 4	N-BOD, microbes			JD1
Class 5	Sewers, fluctuations, loadings	HW2	HW1	
Class 6	Reactors CSTR batch PFR			
Class 7	Nonideal reactors, tracers	HW3	HW2	
Class 8	Rxn order, reactor design modeling			JD2
Class 9	CSTR in series, diff PFR CSTR	HW4	HW3	
Class 10	Mass transfer			
Class 11	Biol overview, Yield, energy, half rxn	HW5	HW4	
Class 12	Half rxn, modeling rx, rs			JD3
Class 13	Modeling sludge, nutrients		HW5	
Class 14	Midterm			
Class 15	Ddiscuss Midterm; sludge and nutrients	HW6		
Class 16	Suspended COD types			
Class 17	Suspended equations	HW7	HW6	JD4
Class 18	Suspended expl calc			
Class 19	Suspended sludge problems, SBR	HW8	HW7	
Class 20	Attached growth systems			
Class 21	Attached growth systems	HW9	HW8	JD5
Class 22	Anaerobic treatment			
Class 23	Anaerobic treatment	HW10	HW9	
Class 24	Water reuse			JD6
Class 25	Solids handling		HW10	
Class 26	Solids handing and Review			
Class 27	Presentations			
Class 28	Presentations			

# ENVE F446 Unit Processes: Biological 3-credits

Department of Civil and Environmental Engineering, University of Alaska Fairbanks  
Spring 2016

**Instructor:**

Dr. Srijan Aggarwal, Assistant Professor,  
Water & Environmental Research Center  
Department of Civil and Environmental Engineering  
Room 271 Duckering, Tel 474-6120, [saggarwal@alaska.edu](mailto:saggarwal@alaska.edu)

**Pre-requisites:** MATH F302, or instructor permission  
Recommended: CE F341

**Lectures:**

Tuesday & Thursday 15:40-17:10, Duck 306

**Office Hours:**

Tues. 11:00-12:00, Thurs. 11:00-12:00, but feel free to stop by any time

**Textbook:**

Required: Metcalf & Eddy, revised by G. Tchobanoglous, F.L. Burton and H.D Stensel: Wastewater Engineering Treatment and Reuse. McGraw Hill, 4th edition, 2003 (in bookstore).

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After going through this course students will be:

- able to apply mathematical principles to wastewater treatment
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- more comfortable in reading and critique of primary scientific literature

**Instructional methods**

Lectures with supporting reading from textbooks and primary scientific literature will form the knowledge base of the course. Relevant journal articles will be assigned for critical group discussion.

**Evaluation/Grading Policy:**

Quizzes	15 %
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Final grades will be awarded according to the following scale:

95-100 **A**; 90- <95 **A-**; 85 - <90 **B+**; 80 - <85 **B**; 75-<80 **B-**;

70 - <75 **C+**; 65 - <70 **C**; 55-<65 **D**; <55 **F**

Either the weighted percentages or a curve may be used, whichever gives best grades.

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4. **Quizzes.** Six to eight surprise quizzes (open book and notes) will be conducted during the course of the semester. Best five quizzes will be considered for the final grade. No make-up quizzes.
5. **Homeworks.** Regular homework problems will be assigned throughout the semester (see course calendar). Homework assignments are due at the 5:00 PM on the due date. Late homework will **NOT** be accepted without prior approval from the professor.
6. **Make up exams:** Exams must be taken on the assigned dates (see course calendar) and in general there will be no makeup exams. Makeups will be given only under extreme circumstances. It is expected that the student will contact the instructor sufficiently in advance of an exam or have sufficient reason that they could not do so. Valid reasons include severe

sickness (attested by physician's certificate), bereavement, or travel on university business (a letter in advance from the supervisor or responsible official).

7. **Absence.** If you are absent from any class it is your responsibility to inform yourself about the class material or any announcements. If you miss a quiz or homework you receive a "zero grade", except when you have made arrangements beforehand for reasons as stated above.
8. **Attendance.** Class attendance at all lectures is **required** and will be monitored. The professor reserves the right to adjust final grades up or down based on a student's course participation. You are welcome to ask questions in class or during office hours. Class participation and discussion makes the course lively and interesting for everyone.
9. **Homework Format:** It is imperative that engineering work be well organized and neatly presented in order to convey the desired information to peers, clients, and other interested parties in a clear, logical manner. Developing these skills of written communication is critical to career development. Pay close attention to these while submitting homework and exams.
10. **Journal Article Discussion.** Articles from scientific wastewater literature will be assigned for reading at the beginning of the semester. You are expected to read these before the discussion date (see schedule) and participate in the discussion. Graduate students or instructors will lead the discussion.
11. **Incomplete.** An "incomplete" will not be given unless severe illness, family tragedy, or a sudden transfer is involved. A written explanation and the completion of the appropriate UAF paperwork must be submitted in all cases.
12. **Disabilities.** If you have specific physical, psychiatric or learning disabilities and require reasonable accommodations, please let me know early in the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability to 'Disability Services' in room 208 of the Whitaker Building and request a letter of accommodation.

### General course outline

No.	Topic	Chapter
1	Overview	1
2	Wastewater flow rates and constituents	2-3
3	Reactor kinetics	4
4	Biological treatment fundamentals	7
5	Biological processes with suspended growth	8
6	Biological processes with attached growth	9
7	Anaerobic biological processes	10
8	Treatment of Solids	14

## Detailed course outline

Date	Topic	Hwout	HW in	Journal discussion
Class 1	Overview			
Class 2	Solids, nutrients, organics			
Class 3	ThOD, COD, BOD calc	HW1		
Class 4	N-BOD, microbes			JD1
Class 5	Sewers, fluctuations, loadings	HW2	HW1	
Class 6	Reactors CSTR batch PFR			
Class 7	Nonideal reactors, tracers	HW3	HW2	
Class 8	Rxn order, reactor design modeling			JD2
Class 9	CSTR in series, diff PFR CSTR	HW4	HW3	
Class 10	Mass transfer			
Class 11	Biol overview, Yield, energy, half rxn	HW5	HW4	
Class 12	Half rxn, modeling rx, rs			JD3
Class 13	Modeling sludge, nutrients		HW5	
Class 14	Midterm			
Class 15	Ddiscuss Midterm; sludge and nutrients	HW6		
Class 16	Suspended COD types			
Class 17	Suspended equations	HW7	HW6	JD4
Class 18	Suspended expl calc			
Class 19	Suspended sludge problems, SBR	HW8	HW7	
Class 20	Attached growth systems			
Class 21	Attached growth systems	HW9	HW8	JD5
Class 22	Anaerobic treatment			
Class 23	Anaerobic treatment	HW10	HW9	
Class 24	Water reuse			JD6
Class 25	Solids handling		HW10	
Class 26	Solids handling and Review			
Class 27	Presentations			
Class 28	Presentations			