

# Space Needs Assessment

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for Lappas + Havener



## Campus Master Plan

2008

# Shepley Bulfinch Richardson & Abbott

## Fayetteville State University

### Space & Classroom Utilization Report

#### Introduction

At the start of the master planning process it became evident that the campus' space inventory as reported to the North Carolina State University system was out of date and incomplete. The campus decided to update the inventory prior to any analysis. Updated data for academic buildings was provided in May 2007 (with some files coming in late June). Classroom data for three semesters (Fall 2005, Spring 2006 & Fall 2006) was provided in late fall 2006.

The updated space data that was provided by the campus was limited to academic buildings only. In addition, three buildings are under major renovation and therefore only limited space use information was provided for them (Taylor and Lilly Gyms and Taylor Social Science). The Lyons Annex, which will add considerable lab, office and teaching space, is not yet occupied. The data for this building is included in this analysis but as will be described below, since it is not yet occupied there are some aspects of the data what are missing at this point in time. Temporary office trailers are not included in the inventory.

In order to complete these analyses, space data from the 2005 State of North Carolina Facilities Inventory & Utilization report for administrative and residential buildings was used. This report will describe the analysis of the data provided as well as the classroom utilization analyses. These analyses are limited as well as not all classroom area information was available.

#### Space Data

Space by Building:

<b>Building</b>	<b>NASF</b>
Barber	20,756
Bronco Hall	41,605
Bryant	28,532
Butler Building	37,950
Capel Arena	70,350
Central Warehouse	10,598
Chesnutt Library	45,575
Chick Building	21,751
Collins	9,491
Continuing Education Center	5,464
Cook Hall	7,449
Harris	15,193
Honors Dorm	27,414
Hood	10,207
Jones Student Center	40,767
Joyner	13,615
Lilly Gym	18,916
Lyons Annex	37,208
Lyons Science	48,776
Maintenance	7,292
Maintenance Storage Shed	2,840
New Dorm	33,740
Rosenthal	21,919
School of Business	43,446
Science Annex	11,524
Seabrook	14,805
Security Building	1,759

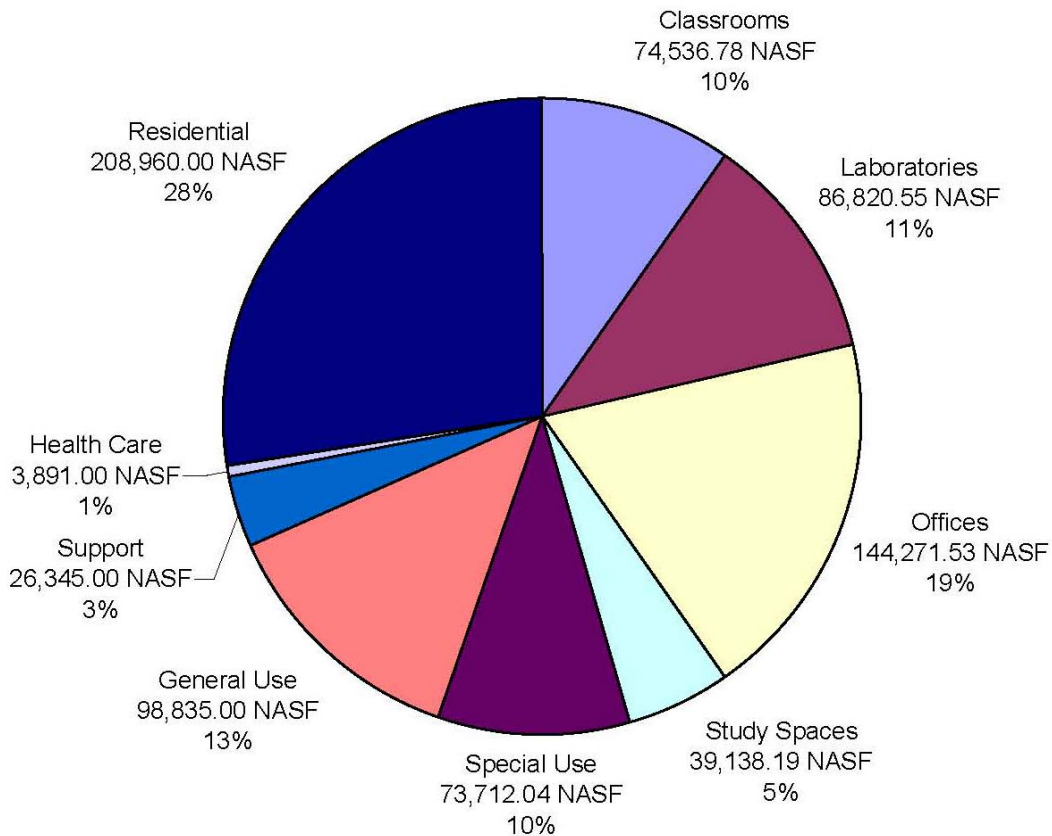
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Building (cont)	NASF
Smith	14,196
Spaulding	4,037
Storage Bldg	672
Taylor Gym	22,790
Taylor Social Science	12,360
Telecommunications	6,980
Vance	35,887
Vehicle/General Storage	3,580
Williams	7,066
<b>Total</b>	<b>756,510</b>

Space is coded in three major ways: by Space Use Code (per NCES Facility Inventory Classification Manual), by Program Code and by Category Code (per HEGIS codes). The space data provided contains a number of spaces without program or category (the equivalent of department) codes.

## Space by Space Use

(Lyons Annex space is coded for the eventual use and is included here).



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## Space by Program Code

(Lyons Annex is coded for Program as "incapable of use" and is represented in the Unassigned field.)

<b>Program</b>	<b>NASF</b>
Instruction	184,702.00
Research	5,492.00
Public Service	1,831.00
Academic Support	50,495.00
Student Service	319,096.00
Institutional Administration	39,241.00
Physical Plant Operations	13,712.00
Independent Operations	370.00
Unassigned	73,881.80
blank	67,689.30
<b>Total</b>	<b>756,510.10</b>

## Space by Category Code

(Lyons Annex is not yet assigned and therefore has no category codes.)

<b>Category</b>	<b>NASF</b>
Accounting	409
Accounting Technologies	115
Aerospace Science	743
Agriculture, General	510
Analytical Chemistry	1,021
Anatomy	758
Art	3,874
Astronomy	158
Biology, General	15,587
Botany, General	1,336
Business & Commerce, General	6,520
Business Economics	732
Business Mgt & Admin	1,067
Chemistry, General	5,431
Communications Media	1,030
Communications, General	354
Computer & Info Sciences, General	944
Criminology	311
Data Processing	679
Education, General	13,212
Embryology	782
English, General	1,923
Fine Arts, General	4,112
Food Services	15,076
Foreign Languages, General	683
General Use	140,047
Geography	521
Geology	1,400
Gymnastics	333

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Category (cont)	NASF
History	938
Housing Services	227,455
Junior & Community College Education	1,377
Library Science, General	28,389
Marketing & Purchasing	520
Mathematics, General	4,233
Microbiology	1,066
Music	4,572
Nursing	5,205
Organic Chemistry	1,022
Physical Chemistry	910
Physical Education	55,751
Physical Science, General	6,135
Physics, General	2,101
Psychology, Counseling	3,502
Psychology, General	1,340
Radiobiology	453
Retail Services & Concessions	3,625
Social Sciences, General	9,181
Sociology	1,299
Softball	54
Track & Field	214
Zoology, General	126
(blank)	177,374
<b>Total</b>	<b>756,510</b>

## Benchmarking

The State of North Carolina University System collects data from each of its campuses on a yearly basis and publishes a series of analyses. The most recent study available on-line is from 2005. Some of these analyses can be used to compare against the data provided, as well as to project needs (which can then be compared against actual numbers after the inventory is fully updated). Master's (Comprehensive) Universities and Colleges I, the group that Fayetteville falls in, also contains Appalachian State University, NC Central, UNC-Pembroke, UNC- Wilmington, and Western Carolina.

The Capacity/Enrollment Ratio relates the amount of space directly used in an institution's instructional programs to the instructional activity of the campus. By multiplying the total student clock hours (sum of a semesters courses as calculated by the number of times a class meets per week x the hours it meets each session x total number of students enrolled) by the average ratio of the other campuses, one can calculate the need for this type of space.

## **Capacity / Enrollment Ratio**

	ASF of Instructional & Lib. Facilities	Total Student Clock Hours	Capacity / Enrollment Ratio
<b>2005 Peer Totals</b>	<b>2,561,248</b>	<b>598,536</b>	<b>4.394</b>
<b>Fayetteville need (calculated)</b>	<b>351,151</b>	79,916	(Fall 2005 hours)

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As a way to calculate the amount of space needed in Academic facilities, one can multiple the FTE Enrollment against the average SF per FTE Student.

## Square Feet of Academic Facilities Per FTE Student

	ASF of Academic Facilities	FTE Enrollment	Square Feet of Academic Facilities Per FTE Student
2005 Peer Totals	3,899,943	44,429	88.6
Fayetteville (2005)	410,558	5,328	77.1
Fayetteville (2006 based on peer average)	472,061	5,328	88.6
Fayetteville (2006 based on national norm of 93 SF)	495,504	5328	93
Fayetteville (2015 based on peer average)	571,194	6,447*	88.6
Fayetteville (2015 based on national norm of 93 SF)	599,560	6,447*	93

\* 6,447 FTE based on current ratio of FTE to Headcount of 83% and projected headcount growth to 7,629

The average total campus ASF in 2005 among the peers was 1,580,000 SF. Using a generalized grossing factor of 1.65, this is approximately 2,607,000 GSF.

## Total ASF Per FTE Student

	ASF	FTE Enrollment	Average ASF/FTE Enrollment
2005 Peer Totals	7,916,085	44,429	179
Fayetteville (2005)	737,352	5,328	138
Fayetteville (2006 based on peer average)	953,712	5,328	179
<b>Fayetteville CURRENT</b>	<b>756,510</b>	<b>5,328</b>	<b>141</b>
Fayetteville (2015 based on peer average)	1,154,013	6,447*	179

Based on this peer comparison, Fayetteville was short 197,200 ASF (325,383 GSF) currently, and will require an additional 397,503 ASF (655,990 GSF) beyond their then holdings to accommodate the planned enrollment growth.

The following analyses allow us to see the specific areas where Fayetteville is short on space, as compared to their peers (deficient areas in **bold**) (this analysis does not include Lyons Annex as it is not yet coded for program; much of the space in it will be Instruction or Research, which will raise these percentages somewhat.

## Percentage Distribution of Assignable Area by Summary Programs

	Instruction 10	Research 20	Public Service 30	Academic Support 40	Student Services 50	Inst. Admin. 60	Physical Plant 70	Indep. Opns. 90	Unassigned 00
Peer Average	28.22 %	2.50 %	1 %	10.1 %	44.68 %	8.26 %	1.66 %	1.48 %	2.98 %
<b>Fayetteville</b>	<b>25.86 %</b>	<b>0.76 %</b>	<b>0.25 %</b>	<b>7.02 %</b>	<b>44.36 %</b>	<b>5.46 %</b>	<b>1.91 %</b>	<b>0.05 %</b>	<b>5.10 %</b>

The overall distribution of space by room use is not out of alignment with the peer averages (this analysis does include Lyons Annex as it was coded by use).

## Percentage Distribution of Assignable Area by Room Use Code

	Classroom Facilities 100	Laboratory Facilities 200	Office Facilities 300	Study Facilities 400	Special Use Facilities 500	General Use Facilities 600	Support Facilities 700	Health Care Facilities 800	Residential Facilities 900
Peer Average	6.9 %	9.04 %	18.24 %	6.94 %	9.32 %	13.6 %	3.98 %	0.32 %	28.82 %
<b>Fayetteville</b>	<b>9.85 %</b>	<b>11.48 %</b>	<b>19.07 %</b>	<b>5.17 %</b>	<b>9.74 %</b>	<b>13.06 %</b>	<b>3.48 %</b>	<b>0.51 %</b>	<b>27.62 %</b>

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A final comparison can be made in terms of classrooms.

## **Assignable Area Per Student Station for Classrooms**

	No. of Rooms	No. of Student Stations	Ave. Stu/Sta Per Room	Total Assignable Sq. Ft.	Sq. Ft. Per Student Station
<b>2005 Peer Totals</b>	653	27,100	41.8	508,611	18.6

As discussed below in the classroom utilization study, in the rooms reported, FSU has an average of 42.6 student stations per room and an average 17.5 SF per station, slightly below the peer average.

The Council of Education Facility Planners International (CEFPI) have developed a set of space planning guidelines (Space Planning for Institutions of Higher Education, 2006) that are used by many schools, particularly state systems, in order to project space needs. The State of North Carolina system uses a modification of some of these guidelines. Specific space use category needs can be developed using these guidelines. Some projections cannot be made as they require additional data not part of this study such as library volumes, number of student with meal plans, etc.). As can be seen from below, there are several categories where Fayetteville is currently deficient.

**Study Space** 25 ASF per station for 20% of FTE students + 8% FTE faculty  
 2006 need  $25 \times 5,328 \times .2 + 296 \times .08 = 27,232$  SF (actual – 18,928 SF)  
 2105 need  $25 \times 6,447 \times .2 + 562 \times .08 = 33,359$  SF

**Athletics/Physical Education** core of 50,000 SF + FTE > 3,000 \* 10 SF + 5,000 SF Intercollegiate Athletic allowance  
 2006 need  $50,000 + 2,328 \times 10 + 5,000 = 78,280$  SF (actual 64,331 SF)  
 2105 need  $50,000 + 3,447 \times 10 + 5,000 = 89,470$  SF

**Media Production** 5,000 SF  
 2006 need 5,000 SF (actual 2,833 SF)

**Animal Quarters** 0.2 SF per FTE  
 2006 need  $0.2 \times 5,328 = 1,065$  SF (actual 4,113 SF)  
 2015 need  $0.2 \times 6,447 = 1,289$  SF

**Greenhouse** 0.5 SF per FTE  
 2006 need  $0.5 \times 5,328 = 2,664$  SF (actual 1,432 SF)  
 2015 need  $0.5 \times 6,447 = 3,223$  SF

**Assembly** core of 14,000 SF + 2 SF x FTE > 5,000 + 8,000 SF (degree in Theater) + 5,000 SF (degree in Music)  
 2006 need  $14,000 + 328 \times 2 + 8,000 + 5,000 = 27,656$  SF (actual 22,366 SF)  
 2105 need  $14,000 + 1,447 \times 2 + 8,000 + 5,000 = 29,894$  SF

**Exhibition** 1 SF per FTE  
 2006 need  $1 \times 5,328 = 5,328$  SF (actual 16,609 SF)  
 2015 need  $1 \times 6,447 = 6,447$  SF

**Lounge** 2.5 SF per FTE (minimum 5,000 SF)  
 2006 need  $2.5 \times 5,328 = 13,320$  SF (actual 25,642 SF)  
 2015 need  $2.5 \times 6,447 = 16,118$  SF

**Merchandising** 2 SF per FTE (minimum 2,000 SF)  
 2006 need  $2 \times 5,328 = 10,656$  SF (actual 6,080 SF)  
 2015 need  $2 \times 6,447 = 12,894$  SF

**Recreation** 1.5 SF per FTE (minimum 3,000 SF)  
 2006 need  $1.5 \times 5,328 = 7,992$  SF (actual 12,143 SF)  
 2015 need  $1.5 \times 6,447 = 9,671$  SF

**Meeting Rooms** 10,500 SF + 2.5 SF x FTE > 3,000  
 2006 need  $10,500 + 2.5 \times 2,328 = 16,312$  SF (actual 11,858 SF)  
 2015 need  $10,500 + 2.5 \times 3,447 = 19,118$  SF

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**Support Facilities** 6% of total ASF-code 700 SF  
2006 need  $692,957 \text{ SF} \times .06 = 41,577 \text{ SF}$  (actual 26,345 SF)

**Central Computer/Telecomm** core of 4,000 SF + .75 SF per FTE>5,000  
2006 need  $4,000 + .75 \times 3,328 = 4,246 \text{ SF}$  (actual 766 SF)  
2015 need  $4,000 + .75 \times 1,447 = 5,085 \text{ SF}$

**Shop, Central & Vehicle Storage** 5% of total ASF-code 720-745 SF  
2006 need  $694,991 \text{ SF} \times .05 = 34,750 \text{ SF}$  (actual 24,311 SF)

**Central Service** 1 SF per FTE, minimum 3,000 SF  
2006 need  $1 \times 3,328 = 5,328 \text{ SF}$  (actual 1,268 SF)  
2015 need  $1 \times 6,447 = 6,447 \text{ SF}$

**Health Care Facilities** core of 2,000 SF + 0.3 SF per FTE>2,000  
2006 need  $2,000 + .3 \times 3,328 = 2,998 \text{ SF}$  (actual 3,981 SF)  
2015 need  $2,000 + .3 \times 4,447 = 3,341 \text{ SF}$

It is also possible to provide projections of space needs by departments based on data that was provided by the University and standard planning guidelines. The following shows the faculty and staff projections by department and a calculated amount of Code 300 (offices, office service, and conference rooms) based on a planning guideline of 180 NASF per person. This allows 120-130 NASF faculty offices, larger offices for chairs/deans, administrative work areas and office service spaces such as mail/copy/file rooms.

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Department	Current		'07-'09			'09-'12			'12-'17			Total Added	
	Faculty	Staff	Faculty	Staff	NASF	Faculty	Staff	NASF	Faculty	Staff	NASF	Faculty	Staff
Telecomm/ WFSS	-	4	-	6	1,080	-	8	1,440	-	8	1,440	-	4
English and Foreign Languages	33	2	36	2	6,840	44	3	8,460	60	4	11,520	28	2
Social Work	19	1	28	1	5,220	37	2	7,020	54	3	10,260	35	2
Sociology	24	1	27	1	5,040	28	1	5,220	28	1	5,220	4	-
Military Science	2	-	4	-	720	4	-	720	8	-	1,440	6	-
Performing and Fine Arts	21	1	25	2	4,860	29	3	5,760	36	3	7,020	15	2
Special Programs	-	29	-	32	5,760	-	37	6,660	-	41	7,380	-	12
CHSS Dean's Office	-	3	-	4	720	-	4	720	-	5	900	-	2
Government and History	34	2	39	2	7,380	43	2	8,100	49	4	9,540	15	2
Nursing	13	3	15	3	3,240	18	4	3,960	22	5	4,860	9	2
College of Basic and Applied Sciences Dean's Office	3	2	3	2	900	3	3	1,080	3	3	1,080	1	1
Psychology	22	1	25	1	4,680	28	1	5,220	34	2	6,480	12	1
Criminal Justice	18	3	23	4	4,860	29	7	6,480	33	7	7,200	15	5
Mathematics and Computer Science	39	2	40	2	7,560	43	2	8,100	45	2	8,460	6	-
Mathematics/Science Education	1	5	1	5	1,080	1	6	1,260	1	6	1,260	-	1
Natural Sciences	36	8	40	11	9,180	45	13	10,440	51	15	11,880	15	7
Educational Leadership	11		13		2,340	15		2,700	15		2,700	4	-
Elementary Education	9		11		1,980	15		2,700	20		3,600	11	
Health, Physical Education	12		18		3,240	22		3,960	24		4,320	12	-
Middle Grades, Secondary & Special Education	9		15		2,700	18		3,240	21		3,780	12	-
Education Dean's Office	2	3	3	3	1,080	4	4	1,440	4	5	1,620	2	2
Accounting	9		10		1,800	11		3,420	11		3,420	2	
Management	15		17		3,060	18		3,240	18		3,240	3	
Managerial Economics and Finance	11	7	12	8	2,160	13	8	2,340	13	8	2,340	2	1
Marketing & Business Education	8		9		3,060	9		1,620	9		1,620	1	
Enrollment Management		3		7	1,260		7	1,260		7	1,260	-	4
Admissions		14		16	2,880		16	2,880		16	2,880	16	2
Financial Aid		12		16	2,880		16	2,880		16	2,880	16	4
Registrar		10		15	2,700		15	2,700		15	2,700	15	5
Fort Bragg		5		7	1,260		7	1,260		7	1,260	7	2
Honors Program		4		6	1,080		11	1,980		11	1,980	-	7
International Education Center		3		4	720		5	900		6	1,080	-	3
Chesnutt Library		36		47	8,460		62	11,160		81	14,580	-	45
Extended Learning	1	10	2	13	2,700	2	17	3,420	2	17	3,420	1	7
Teaching and Learning Center	1	3	2	7	1,620	2	10	2,160	2	11	,340	1	8
<b>Total</b>	<b>352</b>	<b>177</b>	<b>418</b>	<b>227</b>	<b>116,100</b>	<b>481</b>	<b>274</b>	<b>135,900</b>	<b>563</b>	<b>309</b>	<b>156,960</b>	<b>265</b>	<b>133</b>

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The University can compare these projected needs values against current holdings when they complete their inventory update in order to determine planning needs for new facilities.

Departments were surveyed for other unmet and future space needs. The summary and detail sheets of these needs are attached as Appendix A.

## Classroom Analysis

Classroom data was provided for three semesters – Fall 2005, Spring 2006 and Fall 2006. Records for classes that did not meet on the main campus, had no enrollment, or did not meet in the provided list of classrooms were excluded.

There are three utilization rates that are typically looked at in a classroom analysis. One is the station size, which is calculated by dividing the NSF of the room by the number of seats. Typically this ratio should be around 20 SF per seat, though fixed seat lecture halls have less SF per seat (often 12-15 SF per seat) and computer classrooms or classrooms with special equipment or furniture will have a larger SF per seat. This analysis was only done for rooms where SF data was available from the inventory –it was not available for all classrooms. Of these rooms, the average SF/seat was 17.53 SF. Many of the rooms at FSU are tight – they have more chairs in them than is recommended, and therefore are likely not ideal teaching and learning environments.

The second rate is the class hour utilization rate, which compares the total number of hours per week a classroom is scheduled against the total class hours available for a week (based on the standard scheduling blocks). At FSU, the daytime class hour week is 51 hours. Evening classes have a full semester schedule class hour week of x hours and an eight week term class hour week of x hours. The standard here is 67% - typically a classroom should have 34 of its 51 available classroom hours booked for scheduled classes. This 67% rate provides sufficient flexibility for class scheduling. The average at FSU for daytime courses during the Fall 2006 semester was 59%, with values for individual rooms ranging from 20% to 81%. In the evenings, rooms were used only 28.5% of the 21 hours available. Rooms could be used at a higher efficiency than they were for the semesters studied.

The third rate is seat utilization. Here the average class size for any given room is compared to its capacity. Again, the target rate is 67%. A classroom with 30 seats should have on average classes of 20 students in them. This gives flexibility needed in the beginning of a semester when student are shopping for classes (the typical classroom will have more than 67% seats filled prior to the drop/add periods than after). The Fall 2006 average for daytime courses was 62%, near the target, with 80% of the seats in computer classrooms filled, on average, but only 20% of the seats in fixed seat lecture halls filled. In the evenings only 49% of seats were filled, on average.

Fall 2006 Summary data (daytime courses only)

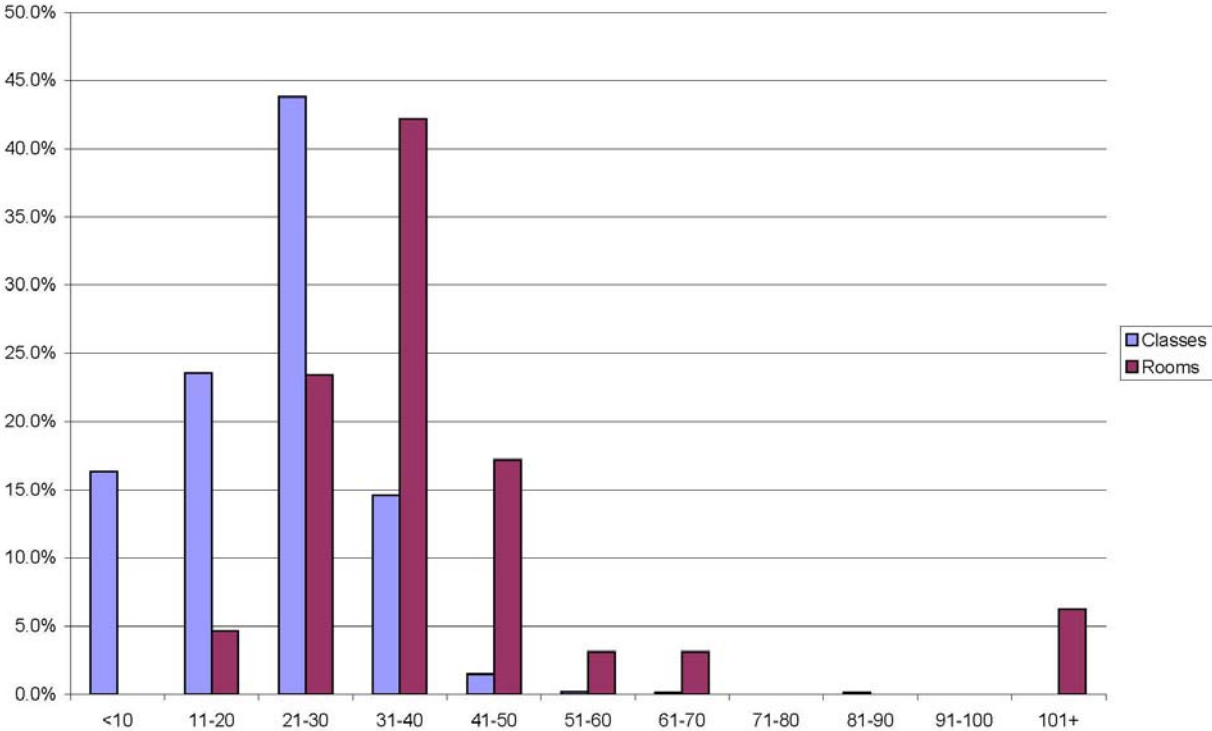
TYPE	TOTAL WEEKLY HOURS	% OF 51hr WEEK (DAY)	AVERAGE ENROLLMENT	CAPACITY	Average of NSF/ SEAT	% OF SEATS OCCUPIED
Auditorium/Lecture Hall	25.94	51%	24.22	133.75	14.03	20%
Classroom	32.94	65%	24.10	33.75	15.15	71%
Computer Classroom	17.00	33%	8.00	10.00	N/A	80%
General Classroom	30.57	60%	23.01	36.69	17.59	66%
General Smart Classroom	30.74	60%	21.89	36.09	18.58	63%
<b>Average of all types</b>	<b>30.24</b>	<b>59%</b>	<b>22.48</b>	<b>42.60</b>	<b>17.53</b>	<b>62%</b>

In addition to these typical rates, the balance between class room sizes (capacities) and class sizes (enrollment) is compared. Room and classes are grouped into categories (less than 10, 11-20, 21-30, etc.) and the percentage of each is compared. Typically scheduling problems result when a school has an imbalance between the percentage of classrooms and the size of their classes. This can result in rooms that are full or exceed capacity or smaller classes placed in larger rooms than are needed, which is not only inefficient but can affect the learning experience (as does over-full rooms).

The data presented here are the averages across all three semesters, as the profiles were essentially the same.

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Class sizes versus room sizes

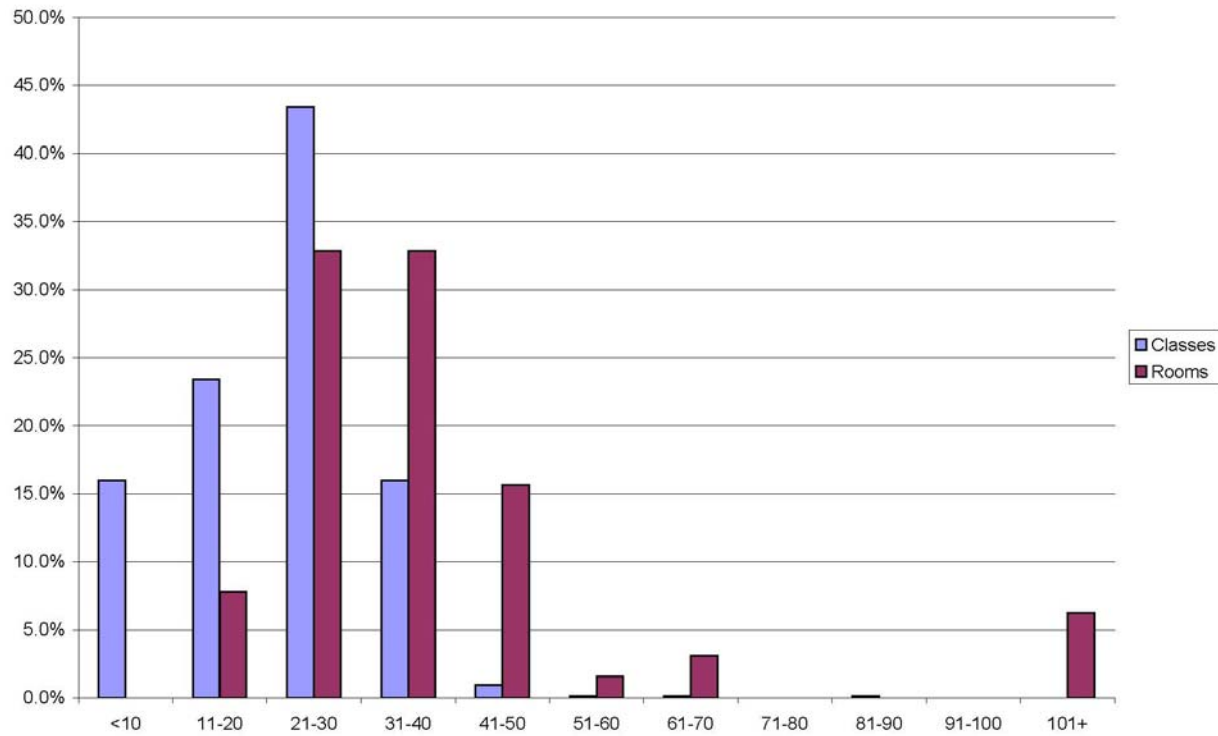


As can be seen in this chart, there is an imbalance between room sizes and class sizes among the rooms analyzed. There are insufficient numbers of classrooms in the 10-30 seat ranges, and an overabundance in the 30-70 ranges. This echoes the data for the numbers of seats filled by room (see appendix). Many classes are being seated in larger than needed rooms.

After examining the result of this comparison, a right sizing exercise is undertaken. Classrooms with non-fixed furniture are right sized – if the SF/seat ratio is less than 20 SF, a new room capacity is calculated to bring this number to 20. As noted before, using a higher ratio improves the comfort of the room, and given the imbalance seen above, it may result in a better balance between room sizes and class sizes.

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Class sizes versus room sizes after right-sizing



Rightsizing rooms does improved the balance, but there still appears to be a need for rooms in the 15-30 seat range as new buildings are being contemplated. The appendix shows the proposed rightsizing scenario for each room.

## Classroom Need

80 rooms were identified by FSU as classrooms for this study (see appendix, Classroom List). Of these, between 57 and 64 had classes scheduled in them per semester. Given the incompleteness of the data it is difficult to identify the actual number of classrooms needed, but one way to determine the number of classrooms needed is to divide the total course hours by the number of hours a room can be scheduled at a 67% rate.

- 51 hour scheduling window x 67% = 34 weekly hours per room (days only)
- 1,802 total course hours (spring 2006) / 34 hours per room = 53 rooms

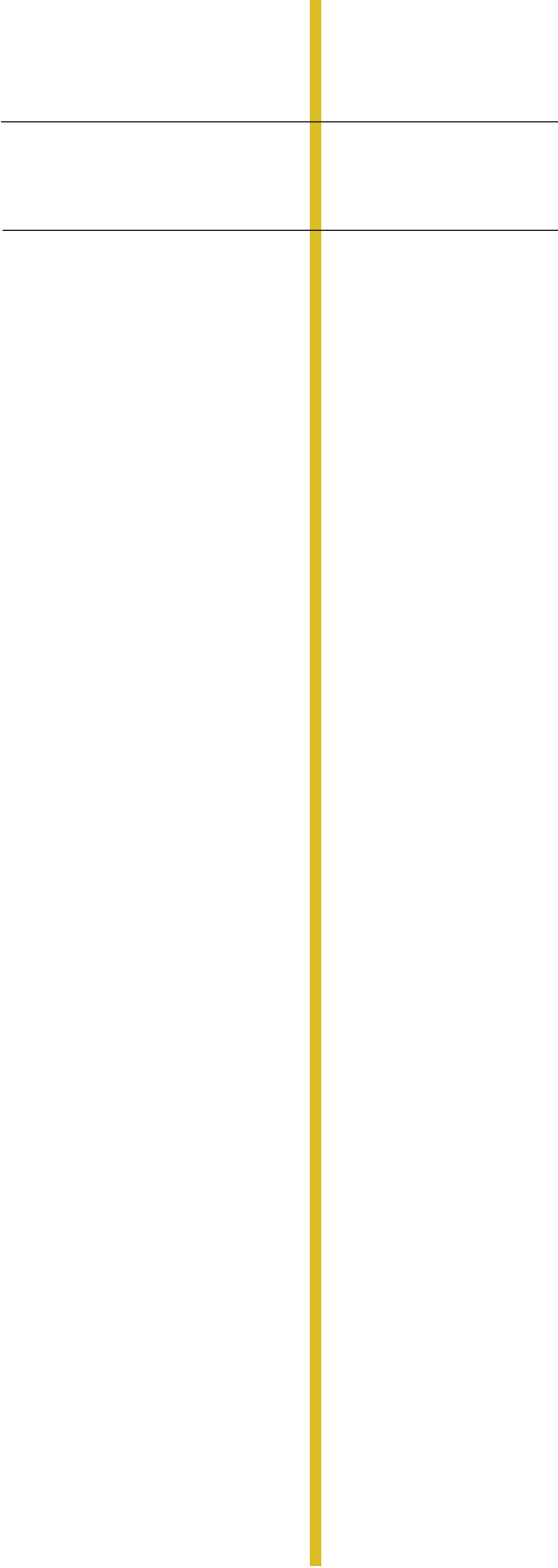
Based on this analysis, it appears that the number of classrooms is sufficient or may even be in excess (though given the incomplete data we do not at this time recommend taking any classrooms off line other than those already removed for ongoing projects).

As the campus projects enrollment growth or changes in pedagogy they can estimate the total course hours for a semester for classes to be housed in general assignment rooms, and then use the above calculation to determine the number needed. If classrooms are to be built, it appears that there is a need for rooms that seat between 15 and 30 as opposed to larger classrooms, even after rightsizing existing rooms, unless class sizes are to change radically.

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## Appendices

- Identified Department Needs
- Fall 2006 Utilization Rates by Room
- Days
- Evenings
- 8 week Evenings
- Rightsizing recommendations



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